CHAPTER 3. FORECASTS OF AIRPORT CAPACITY AND AVIATION ACTIVITY

a. Background and Previous Forecasts

Previous estimates of future aircraft activity levels reviewed in the development of these forecasts are:

- forecasts from 1972 Phoenix-Deer Valley Municipal Airport Master Plan, which cover the period 1975-1990;

- FAA Terminal Area Forecasts (TAF), 1985-1995; and

- Feb. 1984 "Final Report, Aviation Forecasts," prepared for the Maricopa Association of Governments (MAG), which covers the period 1990-2005.

The first of these sources predicted a level of activity based upon the unusually high rates of growth which prevailed in the late 1960's and early 1970's. This growth rate did not continue and the forecasts now appear to be excessively high. These forecasts, together with those from the other two sources are summarized in Table 3-1.

There is general agreement between the FAA data and the "Unconstrained Forecasts" for the MAG region on the rate of growth predicted for the period to 1995 and beyond. The MAG forecasts are recent, authoritative, and provide a good overall framework for the planning of individual airport facilities in the region. Additionally, they are consistent with growth trends in the period 1972-1983. The forecasts developed on the following pages utilize the 4.8% growth rate in annual operations used in the MAG data, except as otherwise indicated.

The approach to development of forecasts includes the use of:

- a 4.8% annual growth rate in aircraft operations for unconstrained growth at Deer Valley. Current demand for tie-down and hangar space at the airport is indicative of the strong growth pressures.

- an unconstrained growth rate until the capacity (or Annual Service Volume - ASV) of the airport is reached, at which point a sharp downturn in the growth rate is assumed, with a leveling-off at a level of operations at or slightly above the ASV where the average delays which would occur would still be tolerated.

- a capacity-constrained annual operational forecast to generate derivative forecasts (based aircraft, busy-hour operations, etc.)

- a facility planning technique that recognizes that activity could exceed the ASV and that a reserve of land for construction of facilities to meet this additional demand late in the planning period, if it occurs, will be maintained.

TABLE 3-1

SUMMARY OF PREVIOUS FORECASTS OF ANNUAL OPERATIONS
DEER VALLEY MUNICIPAL AIRPORT

Year	Actual[1]	1972 Master Plan[2]	FAA Terminal Area Forecasts[3]	Unconstrained MAG Regional Forecasts[4]
1975	166,313	273,000		
1976	224,050	-		
1977	241,675	-		
1978	290,064	-		
1979	296,553	-		
1980	256,985	415,000		
1981	235,067	-		
1982	213,989	-		
1983	240,000	-		
1985		517,000	272,000	275,000[5]
1990		716,000	384,000	375,000[5]
1995			508,000	476,000[5]
2000				577,000[5]
2005				678,000

(1) Source for years 1975-1982 is Activity Report Summation, City of Phoenix. Source for 1983 is FAA Terminal Area Forecasts

(2) Phoenix-Deer Valley Municipal Airport, Master Plan Report, 1972, p. II-5.

(3) FAA Terminal Areas Forecasts, FY 1984-1995.

(4) Final Report "Aviation Forecasts," Maricopa Assoc. of Governments, 1984, p. 38.

(5) Straight-line interpolations between 1982 and 2005.

b. Unconstrained Forecasts of Annual Operations

The unconstrained forecasts for Deer Valley Municipal Airport as presented in the MAG "Aviation Forecasts" are adopted for the Master Plan study. These forecasts are shown in Table 3-1 preceeding.

c. Constrained Forecasts of Airport Activity

The extent to which this unconstrained demand can be met at Deer Valley will be determined by the capacity of the airport. On the following pages the capability of the airport to accommodate this demand is analyzed.

The capacity of the airport to accommodate aircraft activity may be described in two ways; the hourly capacity of the runway/taxiway system, and the Annual Service Volume (ASV). The calculation of these capacities for Deer Valley is completed using FAA's Airport Capacity and Delay advisory circular (AC 150/5060-5).

Hourly Capacity

The hourly capacity of the airport is the number of operations that can be accommodated in a one-hour time period, given the specific runway and taxiway configuration, traffic mix, level of training activity, and incidence of IFR weather conditions.[1]

For Deer Valley, with the 1983 traffic mix (including 1.2% of operations by jet aircraft), an estimated 55 percent level of touch-and-go's, and 0.7 percent occurrence of IFR weather, the hourly capacity is calculated to be 275 operations with the existing runway/taxiway system. The addition of two exit taxiways on Runway 7L-25R would increase the hourly capacity to 294 operations. The hourly capacity of the runway system during IFR conditions is calculated at 63 operations (operations are effectively restricted to one runway).

The level of touch-and-go activity, and the number of jet aircraft and large aircraft (12,500 pounds or heavier) in the mix have major effects on the overall hourly capacity. For the year 2005, both the proportion of jet aircraft operations and the proportion of operations which are touch-and-go's are forecast to change. The hourly capacity of the Deer Valley Airport in 2005 is calculated to be 228 operations, assuming 4.8 percent of operations by aircraft over 12,500 lbs.[2], and 20 to 30 percent touch-and-go activity, which is typical of busy general aviation airports operating at or near capacity.[3] In addition, the Year 2005 capacity assumes that two new exit taxiways are constructed on Runway 7L-25R.

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[1] Ceiling at or below 1,000 feet, and/or visibility below 3 miles.

[2] This level assumes the continuation of the existing ratio between based jet aircraft and daily jet activity, applied to the Regional Aviation System Plan Year 2005 forecast of based aircraft.

[3] Note that if a high level of touch-and-go activity (40 percent or more) were to be maintained to the Year 2005, the hourly capacity would be 294 operations.

Annual Service Volume (ASV)

The Annual Service Volume is an estimate of an airport's annual capacity, taking into account runway use patterns, aircraft mix, weather conditions, and reasonable average levels of delay over a year's time. The ASV is calculated by multiplying the hourly capacity by two separate peaking factors:

- the ratio of annual demand to average daily demand during the peak month (D), and

- the ratio of average daily demand to average peak hour demand during the peak month (H).

In FY 1983, a total of 240,000 operations were conducted at Deer Valley, for a daily average of 657 operations. The peak month for activity was May, with 24,100 operations, or approximately 800 average day operations. During May, the busiest hour was 9:00 a.m.-10:00 a.m., with an average of 87 operations for the month. Using these data, the ratios for D and H were calculated to be 300 and 7.6, respectively. Multiplying the 1984 hourly capacity of 275 (which includes the existing level of touch-and-go's) by 300, and by 7.6, yields a 1984 ASV of 627,000 operations. With the addition of exit taxiways to Runway 7L-25R, the ASV would increase to 670,000 operations.

Applying the same values of D and H to the lower Year 2005 hourly capacity of 228 operations, the Year 2005 ASV is calculated to be 520,000 operations. This ASV is considered to be the best estimate of Year 2005 capacity. If a high level of touch-and-go's (40 percent or more) is maintained in 2005, which is not considered likely, the ASV could be as high as 683,000 operations.

Aircraft Delay Factors

Figure 3-1 depicts the average delay per operation that would be expected to occur at various levels of operation, utilizing the 1984 and Year 2005 ASV's. When demand equals calculated capacity, average delay levels of 2 to 2-1/2 minutes would likely be experienced. Increasing demand by 10 percent above capacity results in an increase in the average delay level to 5-1/2 minutes, a level which will be a severely constraining factor on additional growth in operations.

Annual Operations Forecast

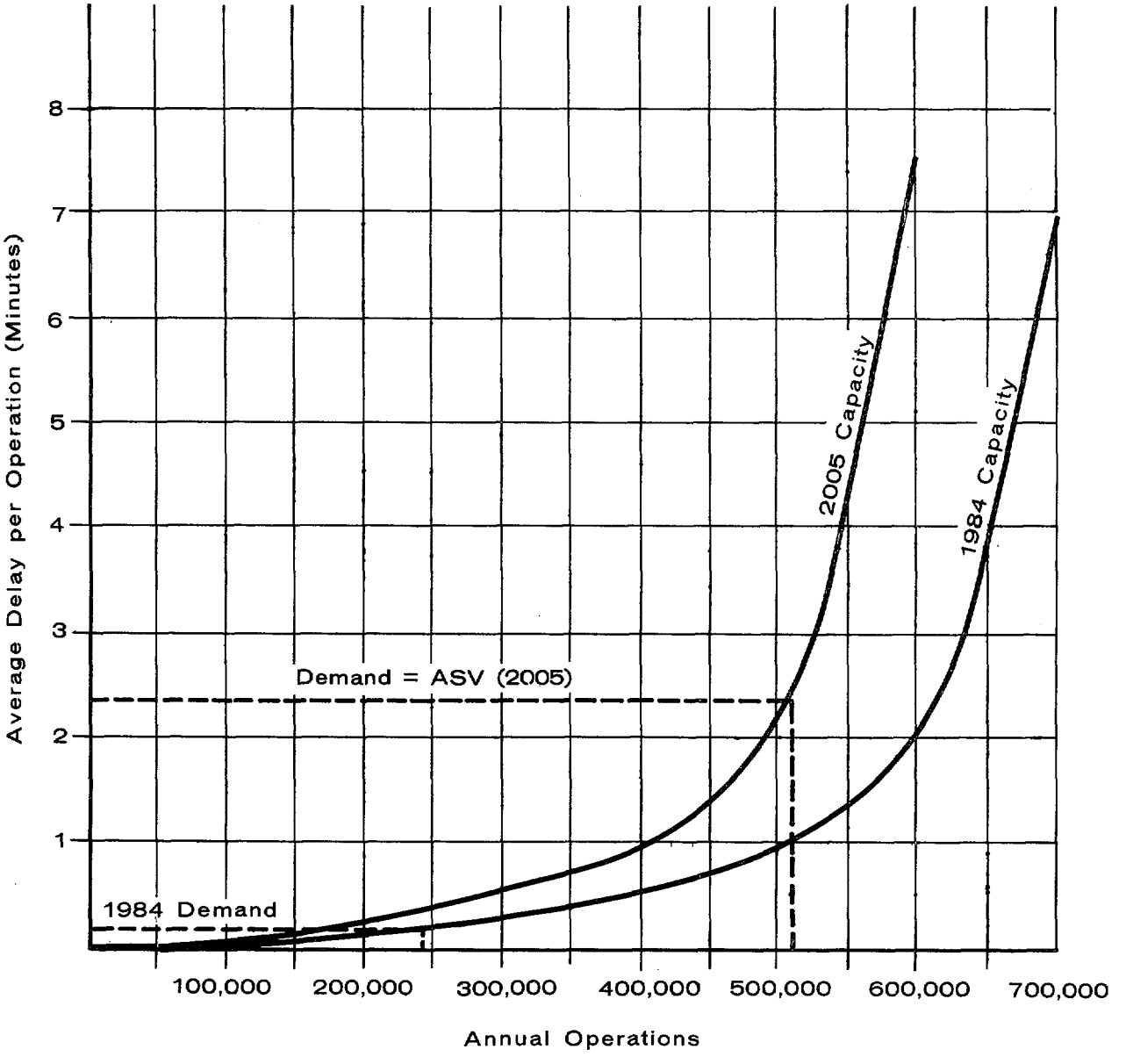
Annual operations are expected to increase at the rate of the unconstrained forecasts of demand until the ASV of 520,000 annual operations is reached in 1997, at which point the growth curve will flatten out.

The ASV for Deer Valley for the Year 2005, as calculated previously, is 520,000. This figure is the best estimate of future capacity and will be used for planning purposes beyond 1997, although it is recognized that activity could exceed the ASV by a small amount at a cost of significantly increased delays.

AVERAGE AIRCRAFT DELAYS, 1984 & 2005

FIGURE 3-1

PHOENIX–DEER VALLEY MUNICIPAL AIRPORT



The reservation of land areas to accommodate additional facilities necessitated by a higher demand level (up to 600,000 annual operations), due to activity exceeding the ASV and/or a higher level of touch-and-go activity, will be maintained in development of the airport plans.

Table 3-2 presents a summary of the recommended annual forecasts for the Master Plan. This forecast is compared to previous forecasts in Figure 3-2.

TABLE 3-2

RECOMMENDED FORECASTS OF ANNUAL AIRCRAFT OPERATIONS, 1995-2005
DEER VALLEY MUNICIPAL AIRPORT

Year	No. of Operations
1983	240,000 (actual)
1985	275,000
1990	375,000
1995	476,000
2000	520,000(1)
2005	520,000

(1)Level of 520,000 annual operations reached in 1997.

Based Aircraft

The number of based aircraft that can be expected to be located at Deer Valley by 2005 will be related to the available runway capacity. The year 2005 forecast annual operations level of 520,000 should result in approximately 1040 based aircraft; this figure is based on a forecast of 500 operations per based aircraft (OBA) factor from the Regional Aviation System Plan.[1] For intermediate years 1990 and 1995, total based aircraft were forecast to be 750 and 952,respectively, using a combination of the actual 1983 OBA and the Regional Study forecast OBA.

The based aircraft mix for Deer Valley was derived using the existing (1983) mix and year 2005 mix for Scenario 2 from the Regional Study, with an interpolation technique used for intermediate years. Based business jets were forecast using an average of general forecast scenarios in the MAG Study; the Scenario 2 number (1.2 percent of total based aircraft in year 2005) was considered to be low given the extent of commercial develop-

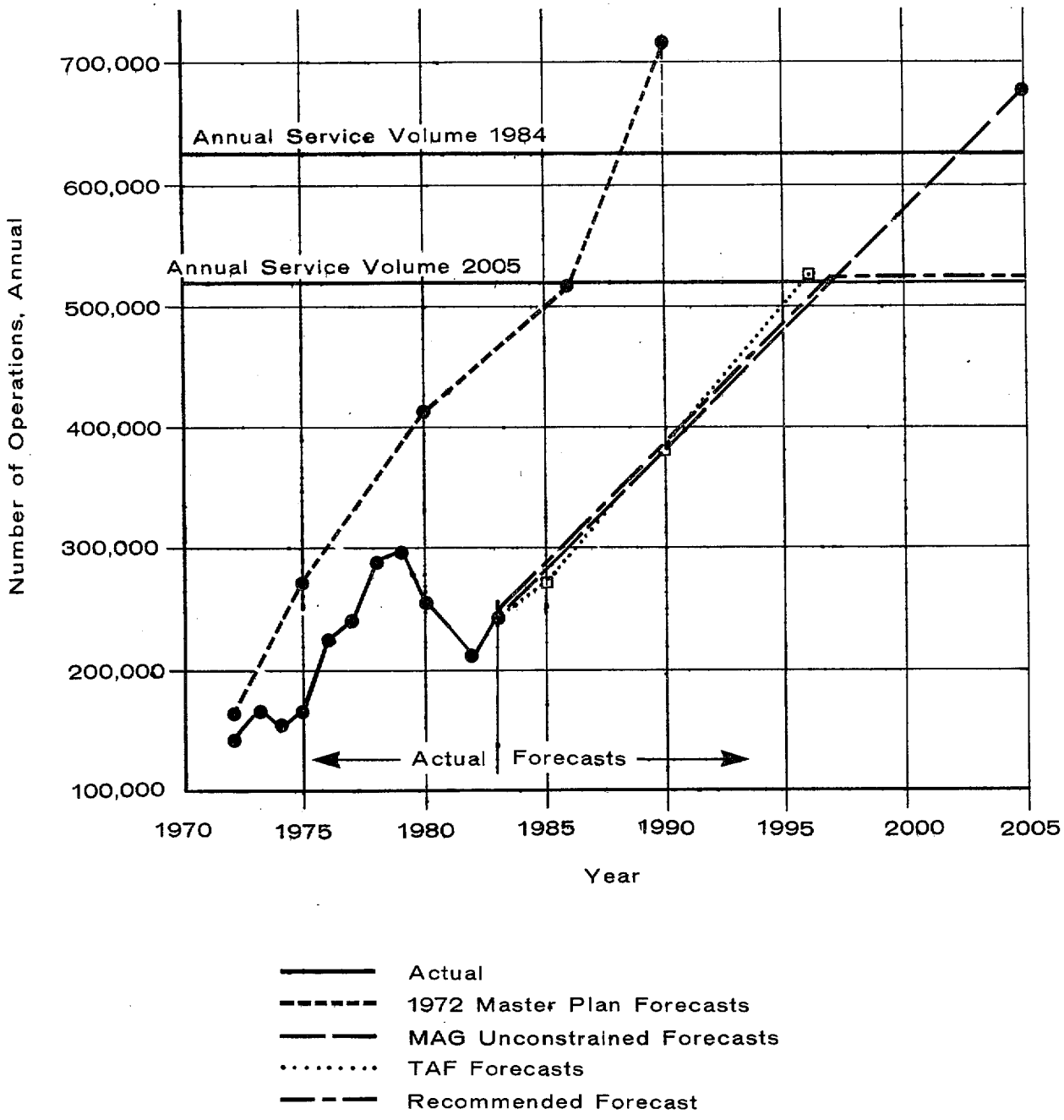
[1]The figure of 500 operations per based aircraft is in the middle of the 450-550 forecast range developed for the regional plan. The increase from the current 390 operations per based aircraft reflects an FAA nationwide forecast of increased aircraft utilization between 1983-1990. After 1990, the FAA forecast does not predict additional aircraft utilization.

COMPARISON OF FORECASTS OF TOTAL OPERATIONS

1983–2005

FIGURE 3-2

PHOENIX–DEER VALLEY MUNICIPAL AIRPORT



ment existing and planned in the airport environment. A year 2005 level of 1.5 percent of total based aircraft was selected, being more in line with the 2.0 percent regionwide figure.

TABLE 3-3

FORECASTS OF BASED AIRCRAFT, 1990-2005
DEER VALLEY MUNICIPAL AIRPORT

Aircraft Type	Existing 1983	1990	1995	2005
Single-Engine	548	658	832	900
Multi-Engine	47	60	77	84
Turboprop	8	8	11	14
Turbojet	5(1)	9(1)	11	16
Helicopter	10	15	21	26
Total Based Aircraft	618	750	952	1040
Operations/ Based Aircraft	390	500	500	500

(1)Includes 3 ex-military jets; these aircraft not counted after 1990.

Local vs. Itinerant Operations

In 1983, local operations accounted for 55 percent of total airport operations. According to Deer Valley ATCT personnel, almost all of this local activity consisted of touch-and-go's. By 2005, the Regional Study predicts that local operations will constitute about 40 percent of the total (with 75 percent of these being touch-and-go's), a figure consistent with many other busy general aviation airports. Using the 55 percent figure for 1983 and 40 percent by 1997 (when airfield capacity is reached), and interpolating for the intermediate years, the split of local and itinerant operations shown in Table 3-4 was derived.

TABLE 3-4

FORECASTS OF SPLIT OF LOCAL AND ITINERANT OPERATIONS, 1990-2005
DEER VALLEY MUNICIPAL AIRPORT

Type of Operation	Existing 1983	Forecasts 1990	1995	2005
Local Operations	132,000	178,000	200,000	208,000
Itinerant Operations	108,000	197,000	276,000	312,000

Busy-Hour and Busy-Day Operations

Calculation of busy-hour and busy-day activity levels is required to determine overall airport facility needs, since it is in these periods that the greatest demands on terminal and airfield facilities occur.

In FY 1984, according to Deer Valley ATCT records, the absolute busy-hour included 194 operations (Oct. 16, 11 a.m.-12 p.m.), of which 55 percent were itinerant. The busy-hour activity level represents 29.5 percent of the average day's activity and 15 percent of the peak day activity.

Current typical busy-hour activity levels, which are used for planning purposes, occur mostly on weekends. They include 120-140 operations, of which 40-60 percent are itinerant. The forecast level of typical busy-hour operations is estimated based on two factors. The first is the existing (1983) relationship between busy-hour activity and average day activity (19.8 percent); the second is that by 1995 it is expected that typical busy-hour activity will reach the hourly capacity of the airport (228 operations).

The absolute busy-day in FY 1984 included 1287 operations (Sunday, October 16). Again, typical busy-days are used for planning purposes; these typical busy-days currently include 900-1000 operations. The busy-day forecast was made using a factor of 1.4 times the average day, the current (1983) relationship. The busy-hour and busy-day forecasts for horizon years 1990, 1995, and 2005 are presented in Table 3-5.

TABLE 3-5

FORECASTS OF BUSY-HOUR AND BUSY-DAY OPERATIONS, 1990-2005
DEER VALLEY MUNICIPAL AIRPORT

Type of Operation	Existing 1983	Forecasts 1990	1995	2005
Busy-Hour Operations	130	190	230	230
Busy-Day Operations	950	1440	1830	2000

Passenger Activity

Passenger activity at the Deer Valley Airport consists of pilots and passengers carried on general aviation flights, whether for business, pleasure or training purposes. Based upon studies performed by the FAA and NASA, and experience at comparable airports, it is estimated that 2.5 pilots and passengers are carried per operation (excluding touch-and-go's). Application of this factor to the forecast level of operations (annual, busy-day and busy-hour) yields the passenger activity shown in Table 3-6.

TABLE 3-6

FORECASTS OF PASSENGERS, 1990-2005
DEER VALLEY MUNICIPAL AIRPORT

	1990	1995	2005
Busy-Hour Passengers	260	350	400
Busy-Day Passengers	1980	2750	3500
Annual Passengers	516,000	714,000	910,000

The above figures assume that there is no introduction of commuter or regularly scheduled airline service into the airport, consistent with the basic assumptions about the future role of the airport in the regional system described in Chapter 2. Should conditions change, a contingency for commuter service would be addressed at that time, depending upon the scale, type and stability of service proposed. The existing terminal facilities are adequate to meet a modest demand for passenger facilities, whether this be commuter service or enhanced air taxi service.

d. Activity Forecasts Summary

The major elements of the activity forecasts described in the preceding section are summarized in Table 3-7.

TABLE 3-7

FORECASTS SUMMARY
DEER VALLEY MUNICIPAL AIRPORT

Item	1990	1995	2005
Annual Operations	375,000	476,000	520,000
Annual Capacity (ASV)	603,000*	544,000*	520,000
Local Operations	178,000	200,000	208,000
Itinerant Operations	197,000	276,000	312,000
Busy-Hour Operations	190	230	230
Busy-Day Operations	1,440	1,830	2,000
Based Aircraft	750	952	1,040

*Interpolated values from 1984 and 2005 ASV calculations.